

**KENT MODULAR ELECTRONICS Ltd.**

**Legacy Pixel Transformer**  
***29LPT1002T***

**User Manual**

## **Contents**

	Page
Overview.....	3
Specifications.....	4
Connecting the LPT Box to Analogue video signals.....	5
BNC Connectors .....	5
15 way D Input connector.....	6
Connecting the LPT Box to TTL Video Signals .....	6
Connecting the LPT Box to your TFT monitor .....	7
User Controls and Indicators .....	9
LED Indicator .....	9
Push Button Controls .....	9
OSD Menus.....	9
OSD Lockout Feature .....	9
Main Menu.....	10
Advanced Menu .....	11
System Menu .....	12
RGB Menu.....	13
Pre-loaded Video Modes & Signal Timings.....	14
Dimensions .....	15
Appendix A .....	16
Notes on Adjustment Procedure for LPT Box.....	16
Notes on resetting Video Modes.....	17
Appendix B .....	18
Suggested Procedure for adjusting the LPT Box with Difficult Video Signals .....	18
Appendix C .....	19
Setting up a second or subsequent LPT Box .....	19
Appendix D .....	19
Output Connector.....	19

## **Overview**

The **29LPT1002T** is a compact RGB video scalar designed for Slow Scan signals. It transforms the low pixel resolution produced by legacy System controllers into full screen displays on modern TFT monitors.

It is proposed as an alternative to KME's UN Series of Slow Scan TFT monitors where benign environments allow the use of a commercial PC monitor instead of an industrial-grade unit.

The **29LPT1002T** accepts a wide range of non-standard RGB video signals (analogue or TTL) and transforms them into DVI-D format with scaling according to the native resolution of the PC monitor. (SVGA, XGA or SXGA) Low refresh rate or interlaced signals are displayed flicker-free with superb clarity. 60+ timings in the 15kHz – 40kHz range are pre-programmed at delivery. Unknown signals are automatically displayed but some fine adjustments will be required for optimisation. New settings are stored and automatically recalled when connected again. The table below shows a small selection of pre-programmed timings:

### **Features:**

- Specially designed for Slow Scan Signals  
(e.g. Siemens WF470, ABB MOD300, GEM 80)
- TTL, Analogue & Interlaced Signals accepted
- Automatic Save of new signal timings
- Output to any standard DVI-D TFT Monitor
- BNC & 15-D input connectors
- Selectable Output Resolutions according to DVI-D monitor used
- Rugged Metal Construction with mounting points
- On-Screen menus for simple control of input signal adjustments.

## **Specifications**

Supply Input voltage	90-265V ac 50/60Hz
Supply Input Connector	IEC 320 type
Power consumption	20W max
Fuse	1.25AT 20mm
RGB Signal	a. Analogue RGB 0.7-1.0Vp-p b. TTL >2.75Vp-p (additional cables required)
Input Connectors	15 pin D, BNC x 5
Sync types & Levels	Separate H&V (+/-ve) TTL or Composite (-ve) TTL or Sync-on-Green (-ve) 0.3V
Slow Scan Support	Pre-programmed Analogue or TTL inputs in 15-40kHz range + Autosave of new signals
Horizontal Scan Rates	15-80kHz
Vertical Scan Rates	40-80Hz
Clock Rate	110MHz max
User Controls	Brightness, Contrast, H/V size & position plus Full OSD Menu functions
Output Connector	DVI-D (connecting directly to monitor's DVI cable)
Output Video Pixel Format	Selectable according to native resolution of monitor used
Output Controls	Full use of TFT monitor's OSD controls
Dimensions	294 x 165 x 58 mm
Weight (approx)	2Kg.
Housing	Painted Steel (Black)
Operating Temperature	0 to +50 deg C
Storage Temperature	-20 to +65 deg C

## Connecting the LPT Box to Analogue video signals

The LPT Box can be connected to most types of video signal. This includes TTL or analogue video, sync on green, composite syncs, separate syncs. The LPT box can accept Equalising pulses and serrations, non-interlaced or interlaced video.

### BNC Connectors

**LPT box has five BNC connectors. These work with analogue video in three, four or five wire systems.**



#### **SEPARATE SYNCs**

5 Wire system:

Video is on three cables, red, green and blue.

Synchronising pulses are on two separate cables, Horizontal syncs and Vertical syncs.



#### **COMPOSITE SYNCs**

4 Wire system:

Video is on three cables, red, green and blue.

Synchronising pulses are combined onto a single cable. These Composite Syncs are connected to the "H" input of the LPT box.



#### **SYNC ON GREEN**

3 Wire system:

Video is on three cables, red, green and blue.

Synchronising pulses are added onto the green video cable.



The LPT Box BNC & 15 way D connectors have  $75\Omega$  termination resistors on their red, green and blue video signal inputs. This is the standard value for most video systems. The resistors can be removed by Switches 1,2,3 on the LPT Box. In the picture, here, The switches are in the On or terminated position. (Switch 4 is not used).

Termination switches are normally only switched off if there is another LPT Box or a legacy CRT monitor connected to the same video signal as the LPT box. In this case the switches on all the displays & LPT boxes should be set so that only one of them is making a  $75\Omega$  termination. Normally the display furthest from the video source is set to  $75\Omega$  in this "loop-through" connection.

For a single LPT Box connected directly to the video source termination switches should be switched ON.

## 15 way D Input connector

The LPT box also has a standard 15 way D signal input. The signals on this connector are treated in exactly the same way as the BNC connectors. So, sync combinations such as sync on green can be used on this input, just as on the BNC connectors.

### Data Input Connector – 15 way high density ‘D’

Pin 1	Red video – 1V 75Ω	Pin 8	Blue ground
Pin 2	Green video – 1V 75Ω	Pin 9	Not Used
Pin 3	Blue video – 1V 75Ω	Pin 10	Sync ground
Pin 4	Not Used	Pin 11	Sync ground
Pin 5	Not Used	Pin 12	Not Used
Pin 6	Red ground	Pin 13	Horizontal sync – (TTL levels)
Pin 7	Green ground	Pin 14	Vertical sync – (TTL levels)
Pin 15	Not Used		

## Connecting the LPT Box to TTL Video Signals



Connection of the LPT box to a TTL signal is by optional Accessory Cable. The cable converts TTL signal on 9 way D connector to 15 way D input on LPT box.

The standard TTL Accessory Cables:

**30PH1244** for 3 or 6 BIT TTL video. This cable is used with most TTL signals.

9 way D	3 bit video	6 bit video
Pin No	(8 colours)	(64 colours)
Pin 1	GND (0v)	GND (0v)
Pin 2	nc	Red Intensity
Pin 3	Red	Red
Pin 4	Green	Green
Pin 5	Blue	Blue
Pin 6	nc	Green Intensity
Pin 7	nc	Blue Intensity
Pin 8	Horiz sync	Horiz sync
Pin 9	Vert sync	Vert sync

**30PH1241** for 4 BIT TTL video. This cable is used where video signal has R, G, B video plus a single “Intensity” input. The most common use of this was the old CGA standard.

9 way D	4 bit video
Pin No	(16 colours)
Pin 1	GND (0v)
Pin 2	nc
Pin 3	Red
Pin 4	Green
Pin 5	Blue
Pin 6	nc
Pin 7	Intensity
Pin 8	Horiz sync
Pin 9	Vert sync



LPT Box with TTL Accessory cable fitted

Note: These TTL Accessory Cables are not supplied with 29LPT1002T and must be ordered separately.

## Connecting the LPT Box to your TFT monitor

### **1) Select a TFT monitor for use with the LPT box**

Make sure it has the correct input connection.

The TFT monitor must have a DVI-D signal input.



DVI-D Input connector on a typical Desktop TFT Monitor

Choose the screen size for the monitor.

The standard LPT Box works best with monitors that have a 4:3 aspect ratio.

These are available in a number of different sizes. Currently 15.0", 17.0" and 19.0" models are popular. Other sizes are also available such as 12.1", 21.3" and 23.1".

The chief difference between different screen sizes is in the number of pixels of each LCD.

Generally:	12.1"	800 x 600 pixels
	15.0"	1024 x 768 pixels
	17.0"	1280 x 1024 pixels
	19.0"	1280 x 1024 pixels
	21.3"	1600 x 1200 pixels

Any of these sizes will work with the LPT box.

16:9 and other aspect ratio screens are also available. These screens will work with the LPT box if they support any of the pixel formats listed above. The LPT box can be configured for special pixel formats by special order.

### **2) Connect the Monitor to the LPT Box.**

The LPT box has a single DVI output connector. Simply connect the monitor's DVI cable to this connector.



DVI Output connector on LPT Box.

### **3) Set the Monitor selector switch on the LPT Box**

The rotary switch next to the LPT Box DVI connector is used to set the LPT box to give the DVI output pixel format that looks best on your TFT monitor.

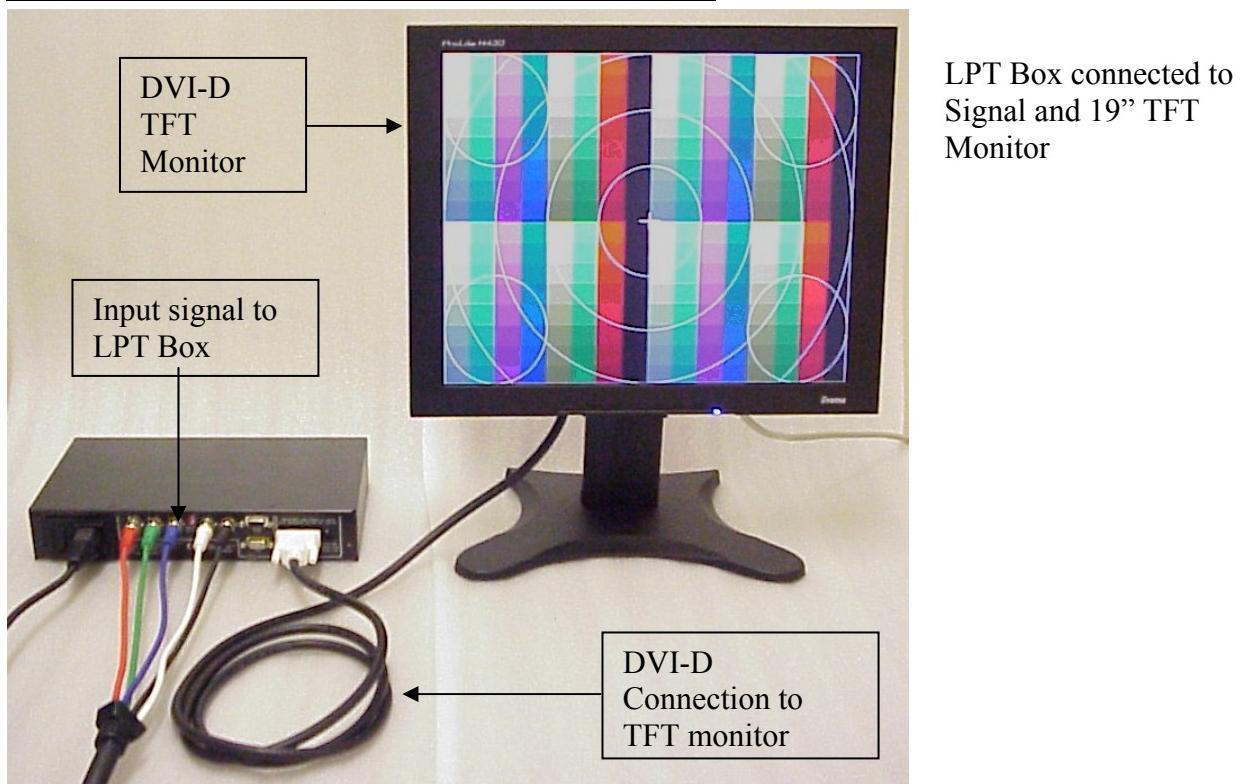
The Switch should be set so that the LPT box is set to be the same as the Native resolution of the TFT monitor. So, for a 15.0" TFT monitor, the LPT box will work best when set to switch position "1" (1024 x 768).



Here, the selector switch is set to "2", 1280 x 1024. This setting is likely to be best for 17.0" and 19.0" TFT monitors, or other displays that have a native resolution of 1280 x 1024 pixels.

You will find that some TFT monitors give an acceptable picture at any setting of this switch.

#### **4) Switch on the LPT Box, Monitor and video signal**



#### **5) Make adjustments to the LPT Box as required**

If the LPT box is connected to a signal that has been pre-programmed in the factory, then little adjustment should be needed. The TFT Monitor should be displaying the correct image and the LPT Box LED should be illuminated green. If the LED is red then there is a problem with the input signal.

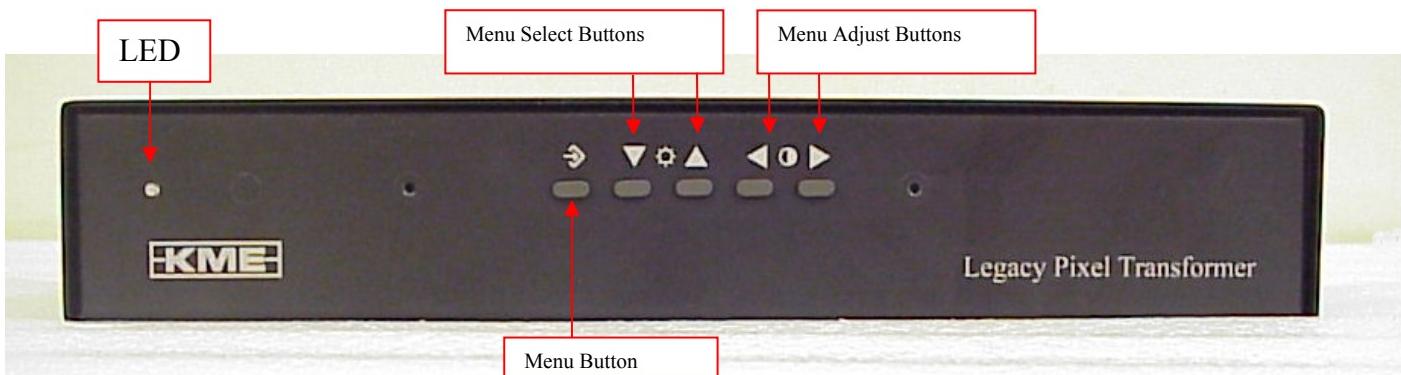
If the Video signal is unknown to the LPT Box, then the picture will initially display with picture size and/or shape positioned wrongly. Manual adjustment is required to obtain an acceptable result.

The following pages describe how the OSD menus can be used to adjust the LPT Box.

If a quick attempt to obtain a correctly aligned picture is not successful, then refer to Appendix A for a procedure to get the LPT Box adjusted to the best settings.

## User Controls and Indicators

The LPT Box is adjusted by OSD menus that are controlled by push buttons on the front of the unit.



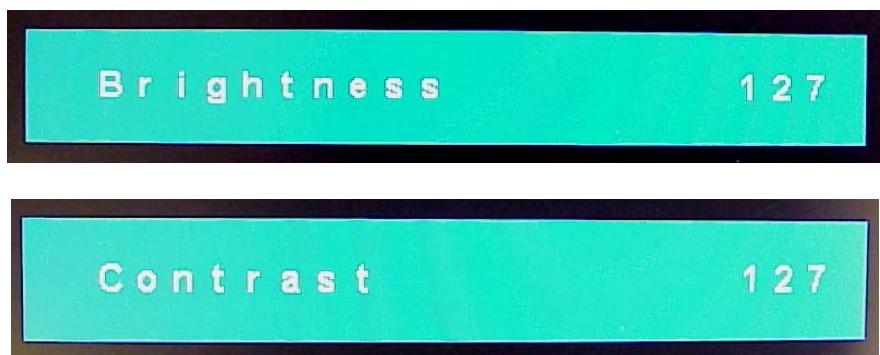
### **LED Indicator**

The LED indicator illuminates to show that the LPT box power is switched ON. A Green Light shows that the LPT box is active, with signals on it's input & output. A Red Light shows that the LPT box has no signal, (or a bad signal) at it's input.

### **Push Button Controls**

#### **Contrast & Video Brightness Quick Adjustment**

Pressing one of the ▼ or ▲ buttons (without the Menu button) will allow quick adjustment of video brightness (unique to each video mode). Pressing either of the ◀ or ▶ buttons (without the Menu button) will allow quick adjustment of the contrast.



### **OSD Menus**

The OSD “Menu” button is used to turn the On Screen Menus on & off.

When switching the Menus off, the monitor automatically saves any adjustments that have been made to the picture. Some Menu Items are only available in certain modes of operation.

The “Menu select” buttons are used to highlight the menu items.

The “Menu adjust” buttons are used to adjust the highlighted item.

### **OSD Lockout Feature**

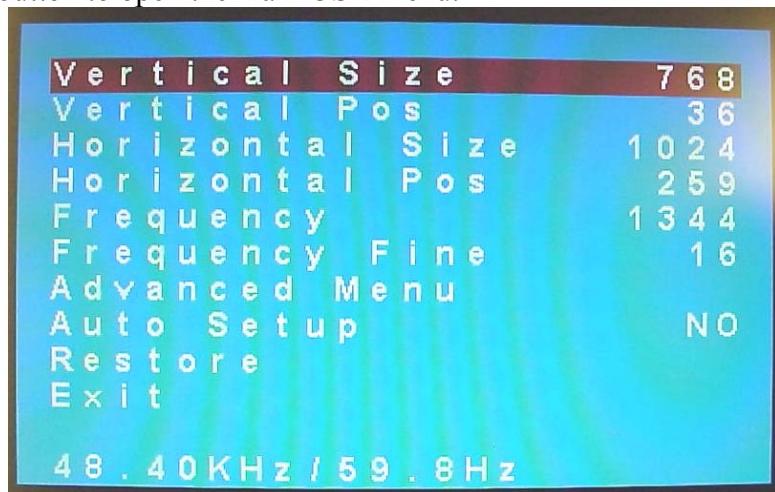
Accidental User adjustment of the monitor controls can be prevented by using the OSD lockout feature. If the Menu button is held down for 15 seconds then the OSD will turn off

and be locked from further access & adjustment. The only user controls will then be Brightness & Contrast.

The LPT Box OSD can be restored to normal operation by holding the Menu button down for a further 15 seconds until the OSD menu reappears.

## Main Menu

Press the menu button to open the main OSD menu.



Vertical Size

*When increasing vertical size (i.e. making image smaller) the value will only increase to the total number of incoming video lines, less a small amount.*

Vertical Position

*Moves picture up & down on screen.*

Horizontal Size

*Changes width of picture.  
See Appendix A for notes on adjustment of Frequency, Width and Frequency Fine.*

Horizontal Position

*Moves picture left and right on screen.*

Frequency

*Adjusts the pixel clock frequency to match the incoming signal.*

Frequency Fine

*Fine tunes the sampling of each pixel.  
See Appendix A for notes on adjustment of Frequency, Width and Frequency Fine.*

Advanced Menu

*Switches to Advance Menu.*

Auto Setup

*NO (default) / VESA / USER / NEW*

*VESA = Uses VESA default values as starting values.*

*USER = Assumes Horizontal and vertical size are already correct.*

*NEW = Automatically sets up LPT Box for current video mode based on a 4:3 aspect ratio.*

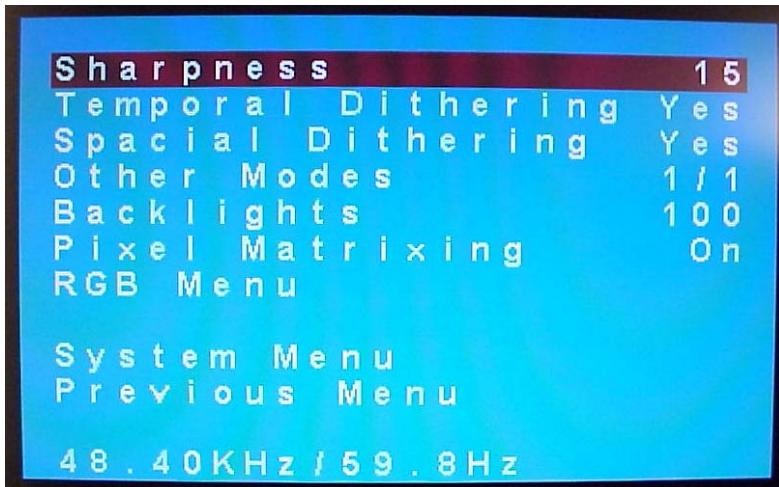
*See Appendix B for notes on Resetting Modes.*

Restore

*Restores OSD back to the values when OSD was*

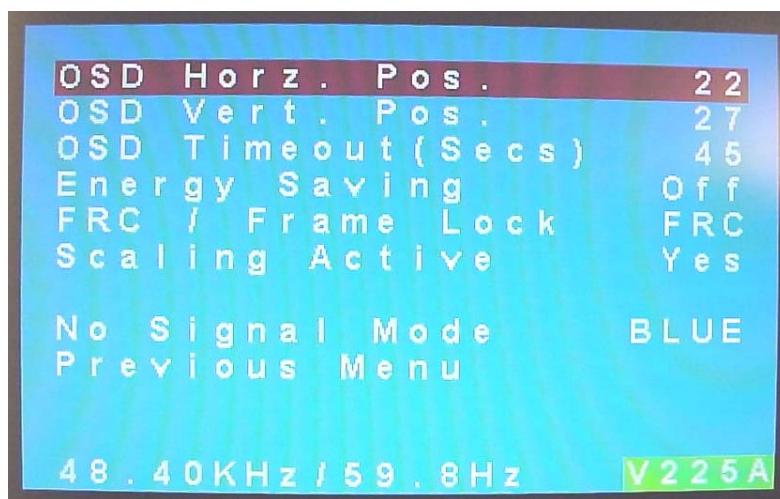
*activated.*  
Exit      *Switches the OSD Menus off and automatically saves the picture settings. Alternatively, simply press the Menu button at any time to switch off OSD and save.*

## Advanced Menu



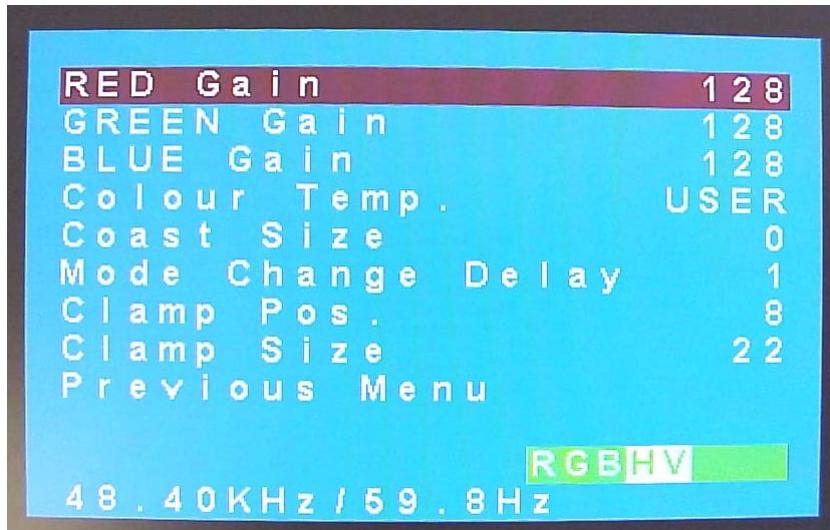
Sharpness	0 – 30	<i>Default 15. Adjust on fine text to adjust preferred hard or soft image.</i>
Temporal Dithering	Yes / No	<i>Dithering causes averaging of pixels to create smoother greys. Some video signals on some TFT panels can cause picture artefacts when dithering is ON.</i>
Spacial Dithering	Yes / No	<i>Other Modes can normally be ignored. If there are more than one signals with identical video timings then the user can use this feature to switch between them.</i>
Other Modes	1/1	
Backlights		<i>Adjusts brightness of TFT backlights.</i>
Pixel Matrixing	On / Off	<i>Automatically adjusts image position every 15 minutes to reduce the effect of image retention which can be caused by displaying static pictures for long periods.</i>
RGB Menu		<i>Switches to RGB Menu.</i>
System Menu		<i>Switches to System Menu.</i>
Previous Menu		<i>Returns to Main Menu.</i>

## System Menu



OSD Horizontal position		<i>Location of OSD menu on the screen.</i>
OSD Vertical position		<i>Location of OSD menu on the screen.</i>
OSD timeout (sec.s)	3 – 45	<i>Timeout period of OSD menu.</i>
Energy Saving	On / Off	<i>When On the LPT Box will switch to standby mode within several seconds of having no signal input.</i>
FRC/Frame Lock		<i>Synchronise Output and Input frame rates</i>
Scaling Active	Yes / No	<i>Enables low resolution image to be viewed without scaling.</i>
No Signal Mode	BLUE/BLACK/NONE	<i>Colour of display when no signal is connected.</i>
Previous Menu		<i>Returns to Main Menu.</i>
Firmware version number	V****	<i>Firmware No. in lower right corner.</i>
Signal Frequency		<i>The LPT Box measures and displays the actual Horizontal and Vertical frequencies of the video input signal.</i>

## RGB Menu



Red, Green, Blue Gains

*Use to adjust USER colour as preferred. Default values are 128 which give Normal display colours.*

Colour Temperature

*User(Default), 8000, 9500, 5000*

Coast Size

*This is used to make LPT Box ignore equalizing (EQ) pulses. Increase the coast size when EQ pulses are making top of picture lean over to left or right.*

Mode Change Delay

*This changes the time that the LPT Box waits before it tries to re-adjust itself to changes in signal input timings. A small value allows fast switching between signals. A large value makes the LPT Box tolerant of unstable or noisy sync pulses. When the LPT Box detects a VESA video mode the default is a small Mode Change Delay. When a Slow-Scan or Industrial video mode is detected the default is large.*

Clamp Position

*The video clamp fixes the black level of the video signal to the correct level. If the clamp is too long or its position is wrong then a black bar may be seen at the left hand edge of the picture. Adjust Clamp size & position to fix this if required.*

Clamp Size

Previous Menu

*Returns to Advanced Menu*

**RGB** status

*The block of status letters have the following information:*

**R**GB Sync on Green not present

**R**G**s**B Sync on Green present

**H** H Sync present. Inverted colour indicates neg. polarity. Normal colour for pos polarity.

**V** V Sync present. Inverted colour indicates neg. polarity. Normal colour for pos polarity.  
(When Composite Sync is input the display shows H Sync present & V Sync not present).

**E** Equalising pulses present on V Syncs.

**S** Serration pulses present on V Syncs.

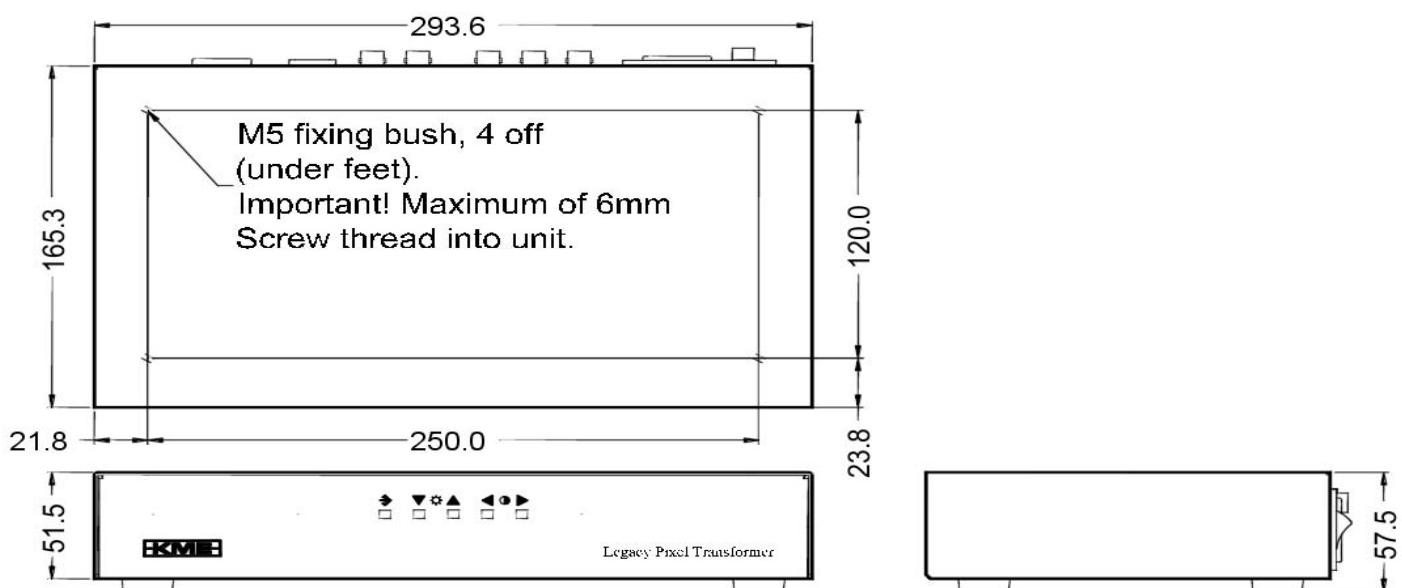
**I** Interlaced video present.

## **Pre-loaded Video Modes & Signal Timings**

<b>Mode</b>	<b>Resolution</b>	<b>Vertical Rate (Hz)</b>	<b>Horiz Rate (KHz)</b>
001	1024 x 768	60	48.35
002	640 x 480	60	31.47
003	800 x 600	56	35.21
004	470 x 350	70	31.47
005	1280 x 1024	60	64.00
006	562 x 336	50	17.86
007	1024 x 389	40	16.67
008	1600 x 1200	60	75.00
009	714 x 576	50	15.62
010	724 x 401	70	31.10
011	1600 x 900	60	55.92
012	720 x 400	70	31.47
013	720 x 400	70	31.47
014	720 x 353	70	31.47
015	xxx x xxx	50	15.67
016	xxx x xxx	60	15.74
017	640 x 384	50	20.65
018	640 x 384	60	24.78
019	640 x 246	60	15.62
020	570 x 340	50	17.86
021	808 x 238	60	15.62
022	330 x 449	66	31.25
023	560 x 275	50	15.62
024	640 x 200	60	15.74
025	640 x 350	60	21.86
026	577 x 430	70	16.79
027	504 x 336	50	17.86
028	508 x 238	60	15.74
029	560 x 301	50	16.10
030	560 x 238	60	15.74
031	1026 x 660	50	27.03
032	511 x 512	50	31.25
033	560 x 223	50	15.62
034	560 x 446	50	15.62
035	560 x 224	60	15.62
036	560 x 446	60	15.62
037	560 x 448	72	34.50
038	640 x 448	70	16.34
039	640 x 480	73	37.86
040	640 x 480	75	37.50
041	640 x 480	85	43.27
042	640 x 480	100	50.89
043	800 x 600	60	37.90
044	800 x 600	72	48.00
045	800 x 600	75	46.90
046	800 x 600	85	53.67
047	800 x 600	100	63.69
048	1024 x 768	72	57.67
049	1024 x 768	75	60.00

050	1024 x 768	85	68.70
051	1024 x 768	100	81.43
052	1280 x 1024	72	76.87
053	1280 x 1024	75	80.00
054	1600 x 900	72	67.52
055	1600 x 900	75	70.52
056	1280 x 768	60	47.73
057	1280 x 768	72	57.73
058	1280 x 768	75	60.13
059	1280 x 768	85	68.68
060	1280 x 768	100	81.43
061	962 x 240	58	15.31
062	484 x 243	50	15.62
063	580 x 285	50	15.62
064	570 x 340	50	18.52
065	640 x 350	60	21.86
066	1024 x 768	70	56.46
067	566 x 288	50	15.62
068	766 x 292	50	15.62
069	Xxx	50	15.62
070	Xxx	60	15.72
071	Xxx	60	15.72
072	812 x 526	56	35.12
073	568 x 290	50	15.62
074	575 x 590	50	31.25
075	644 x 228	50	15.62
076	546 x 546	55	31.15
077	640 x 280	42	15.63
078	1024 x 700	37	29.76
079	724 x 336	60	21.86
080	720 x 526	50	31.25
081	640 x 480	60	31.47
082	576 x 436	57	26.47
083	1024 x 768	86	35.51

## Dimensions



## **Appendix A**

### **Notes on Adjustment Procedure for LPT Box.**

#### **I). Frequency, Frequency Fine and Horizontal Size.**

When adjusting the *Frequency* the width of the displayed image will change. The *Frequency* control is not just a width control. For best results the *Frequency* should be correctly matched to the video signal without worrying about the picture width. When the *Frequency* is correct the width can then be corrected with the *Horizontal Size* control.

The Video signal is made up of pixels. These are generated in the video generator (process controller, PC etc). A crystal oscillator controls the rate at which the pixels are generated: This is called the Dot Clock.

When the LPT Box receives the video signal it must convert it back to its individual pixels in digital form. To do this it must sample the video at the same rate as the dot clock.

When the *frequency* control is adjusted the LPT Box is changing the rate at which the video is sampled. Each press of the *frequency* control changes the sample rate by one pixel per line. The visual effect on the LPT Box screen of incorrect *frequency* adjustment is that there are vertical bands of darkened or noisy pixels running down the screen. The greater the *frequency* error, then the more bands there are. If the *frequency* value is wrong by two pixels, then two noisy bands will be seen. If the value is wrong by 100 pixels, then 100 noisy bands will be seen. Strangely, a picture that has the *frequency* wrong by a very large amount can actually appear better than one where the *frequency* is only slightly wrong.

The actual content of the picture also has a big effect on how easy it is to see the noise bands. To set the *frequency* easily, it is best to display a picture that has a large number of individual pixels displayed – a screen of “████████” will be very good for helping to make the adjustment, while “████” or “██” will completely hide the noise bars. In practice it is not always possible to control the characters like this, so adjustment has to be made with pages of text etc.



Frequency correct



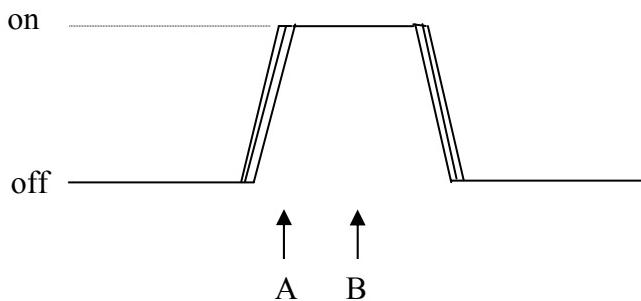
Frequency wrong

A Windows Shutdown screen contains a large amount of the “████████” type of video so is very good for seeing the effect of the frequency setting. The left hand picture shows the shutdown screen with frequency correctly set.

In the right hand picture there are six vertical dark bands due to incorrect frequency.

It can be helpful to practise setting frequency on this picture before trying on a real system.

## Frequency Fine



This figure shows what a single bright pixel looks like in the video signal. The pixel does not have vertical sides and the exact start time of the pixel is uncertain.

If the monitor samples the pixel at “B”, then the pixel will look good. If it is sampled at “A” then the uncertainty of the pixels start time and the slope of the pixel edge will combine to make the pixel appear noisy and dark on the screen.

It is the *frequency fine* control that lets the LPT Box be adjusted so that the sample is taken at B instead of A.

## Notes on resetting Video Modes

The LPT Box is shipped from the factory with a pre-loaded set of commonly used video modes. This means that the LPT Box can immediately be connected to a variety of video sources without any adjustment required.

The LPT Box may be connected to a video signal that has not been previously seen or pre-loaded. In this case the LPT will try to fit one of its existing modes to fit to the new signal. This may not cause the best results.

It can be advantageous to select the “Reset Mode(s)” NEW option on the OSD menu. This will tell the LPT to ignore the pre-loaded programs and adjust itself to the signal timing.

In general it is good to perform the NEW option when trying to connect to new signals.

The Reset Mode(s) VESA option should be used when the video signal is known to come from a PC. The auto-setup will start with known default VESA values when this option is selected.

The Reset Mode(s) USER option is selected when the horizontal and vertical size are already correct, the auto-setup will then adjust the frequency and horizontal/vertical position until the image is central.

## **Appendix B**

### **Suggested Procedure for adjusting the LPT Box with Difficult Video Signals**

If the LPT Box is connected to a signal that has been pre-programmed in the factory, then little adjustment should be needed.

If the Video signal is unknown to the LPT Box, then the picture will initially display with picture size and/or shape positioned wrongly. Manual adjustment is required to obtain an acceptable result.

If a quick attempt to obtain a correctly aligned picture is not successful, then the procedure below can be used to get the LPT Box adjusted to the best settings.

This procedure should let you get the LPT Box adjusted near to the best settings. Some further fine adjustment may be needed for best results.

1. Connect the signal to the correct input connectors and apply power to the LPT Box.
2. On the OSD Main menu select *Auto Setup - NEW*. Press the menu button. This will force the LPT Box to calculate settings for the new video signal.
3. Adjust the *Vertical Size* and *Vertical Position* so that the height of the picture is correct.
4. If there is particular instability of the picture at the top of the picture then increase the *Coast* value. Normally, this action is not required.
5. If the picture is flashing on & off or moving about the screen then increase the value of *Mode Change Delay*. Normally this action is not required
6. If the picture has a vertical black band showing at the left hand side, or if the colours appear darker in some parts of the screen then adjust the *Clamp Position & Clamp size*. Normally this action is not required.
7. Adjust the *Frequency & Horizontal Size* as well as the *Horizontal position & Frequency Fine* to make the picture width and position correct. Spending time on this part of the adjustment will result in best displayed image.

Appendix A gives some information about the meaning of these adjustments.

As a starting position it is worth trying to get the *Horizontal Size* correct. You may already know from the video signal specification what its values are. These are commonly expressed in a variety of ways:

- a. If the graphics are 512 x 320 pixels (say) then the correct value for *Horizontal Size* is 512.
- b. There may be 80 characters with a 5 x 7 character cell. This makes the *Horizontal Size*  $80 \times 5 = 400$  pixels (Or 480 pixels if a character spacing pixel is also used).
- c. The Pixel Clock may be specified – in this case you can work out the correct *Frequency* by dividing the Pixel Clock frequency by the Horizontal Frequency that is displayed on the LPT Box OSD.

If there are no specifications for the video signal then just use the setting that the LPT Box has generated when performing the *Auto Setup - NEW*.

## **Appendix C**

### **Setting up a second or subsequent LPT Box**

You may need to connect a second LPT box to the same video signal, or to an identical system. In this case most of the OSD settings for the second LPT box will be identical to those of the first LPT Box.

The important settings to record from the first LPT box are:

Frequency	Horizontal Position
Vertical Position	Horizontal Size
Vertical Size	Coast Size
Mode Change Delay	Clamp Position
Clamp Size	

The value of Frequency Fine is likely to be different between the different LPT boxes. This is because Frequency Fine is making an adjustment that compensates for the small timing differences caused by such things as the interconnecting video cable lengths.

## **Appendix D**

### **Output Connector**

**29 pin DVI Connector Pin out and Signal Names**

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	TMDS Data2-	9	TMDS Data1-	17	TMDS Data0-
2	TMDS Data2+	10	TMDS Data1+	18	TMDS Data0+
3	TMDS Data2/4 Shield	11	TMDS Data1/3 Shield	19	TMDS Data0 Shield
4	TMDS Data4-	12	TMDS Data3-	20	TMDS Data5-
5	TMDS Data4+	13	TMDS Data3+	21	TMDS Data5+
6 *	DDC Clock [SCL]	14*	+5 V Power	22	TMDS Clock Shield
7 *	DDC Data [SDA]	15	Ground (for +5 V)	23	TMDS Clock +
8 *	Analogue vertical sync	16 *	Hot Plug Detect	24	TMDS Clock -
C1 *	Analogue Red	--	--	--	--
C2 *	Analogue Green	--	--	--	--
C3 *	Analogue Blue	--	--	--	--
C4 *	Analogue Horizontal Sync	--	--	--	--
C5 *	Analogue GND Return: (analogue R, G, B)	--	--	--	--

Pins marked \* are not used on the 29LPT1002T